

New Frogs (Anura: Microhylidae) from the Mountains of Western Papua New Guinea

FRED KRAUS

Bishop Museum, 1525 Bernice St., Honolulu, Hawaii, United States of America
fkraus@hawaii.edu

ABSTRACT. I describe two new species of microhylid frogs from the mountains of the central cordillera of western Papua New Guinea. One of these is in the arboreal genus *Oreophryne*; the other is in the fossorial genus *Xenorhina*. The *Oreophryne* is one of the largest members of the genus and is characterized by a ligamentous connection of the procoracoid to the scapula, webbing between the toes, fifth toe equal in length to the third, and a relatively short leg, wide head, long and narrow snout, and small finger discs. The *Xenorhina* species is among the smallest species of the genus and is distinguished by having a single odontoid spike, discs with circum-marginal grooves on all toes but the first, inflated lores, and a relatively long leg, short and broad head and snout, and features of color pattern. The *Oreophryne* is known from two localities approximately 30 km apart, and the *Xenorhina* is known only from its type locality. Both occur in the high mountains of Western Province, Papua New Guinea.

KRAUS, FRED, 2011. New frogs (Anura: Microhylidae) from the mountains of western Papua New Guinea. *Records of the Australian Museum* 63(1): 53–60.

Frogs are a major component of vertebrate biodiversity in the Papuan region (New Guinea and associated islands plus the Solomon Islands), with >400 species described from the region to date. This represents almost 6% of global amphibian diversity in an area comprising approximately 0.5% of the world's land area. This diversity no doubt stems from the region's high degree of mountainous terrain and insularization, both of which promote isolation and speciation. Yet the Papuan region's amphibian diversity remains poorly surveyed and described. Ongoing surveys have identified scores of new species requiring description, and additional undescribed species from earlier collections reside in museums. Many of these are not easily diagnosed because they lack information on advertisement calls or color in life that frequently allow for ready distinction among close relatives. However, some species are sufficiently distinctive morphologically that they present no difficulty in being diagnosed from already-known species. I identified several such species while working in the herpetological collection of the Australian Museum, Sydney in 2006 and 2007. Some of these have subsequently been described (Richards, 2007;

Richards *et al.*, 2007). I take this opportunity to describe two of the remaining species, both members of the family Microhylidae. Each is from the mountains of the central cordillera of Papua New Guinea.

Materials and methods

All measurements were made with digital calipers or an optical micrometer to the nearest 0.1 mm, with the exception that disc widths were measured to the nearest 0.01 mm. Measurements, terminology, and abbreviations follow Zweifel (1985) and Kraus and Allison (2005a, b): body length from snout–vent (SV); tibia length from heel to outer surface of flexed knee (TL or TL_{knee}); horizontal diameter of eye (EY); distance from anterior corner of eye to center of naris (EN); internarial distance, between centers of external nares (IN); distance from anterior corner of eye to tip of snout (SN); head width at widest point, typically at the level of the tympana (HW); head length, from tip of snout to posterior margin of tympanum (HL); horizontal tympanum diameter (TY); width of the third finger disc (3rdF); width of the

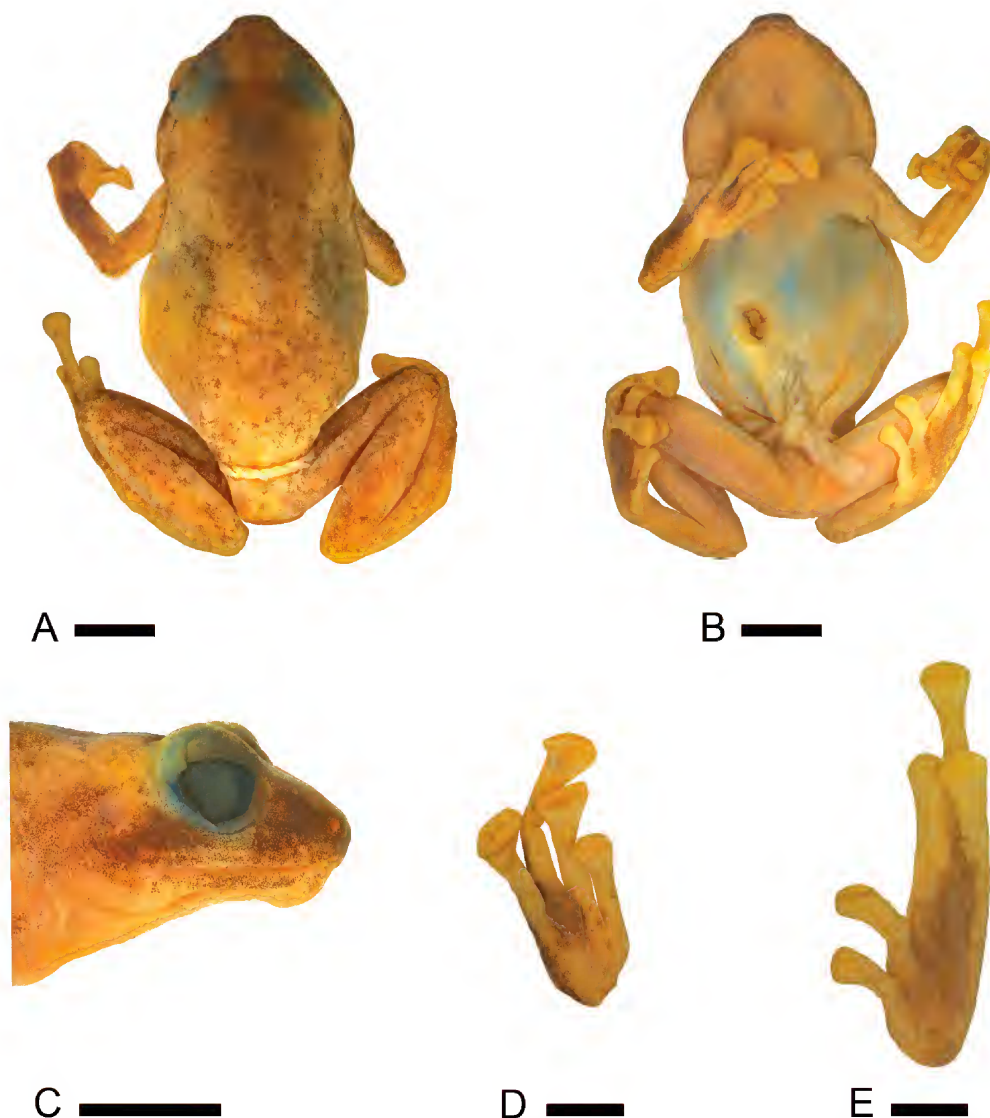


Fig. 1. Views of (A) dorsum, (B) ventrum, (C) side of head, (D) right hand, and (E) left foot of holotype (AMS 30742) of *Oreophryne ampelos*. Scale bars = 5 mm (A–C) and 3 mm (D–E).

fourth toe disc (4thT). For comparison to earlier literature for *Xenorhina* (Zweifel, 1972) I also measured tibia length from heel to skin fold near the knee (TL_{fold}) in that genus.

I confirmed by dissection generic assignment to *Oreophryne* using the presence of an eleutherognathine jaw and reduction of clavicles and procoracoids (Parker, 1934). Comparisons to congeners relied on direct comparison to museum material and to information provided in original descriptions by Roux (1910), Parker (1934), Richards & Iskandar (2000), Günther *et al.* (2001, 2009), Günther (2003a,b), Zweifel (2003), and Zweifel *et al.* (2003, 2005). I confirmed by dissection generic assignment to *Xenorhina* using the presence of a symphygnathine jaw and relatively small eyes and narrow head (Zweifel, 1972). Comparisons to congeners relied on direct comparison to museum material and to information provided in Zweifel (1972), Menzies & Tyler (1977), Blum & Menzies (1988), Allison & Kraus (2000), Kraus & Allison (2002, 2003), Günther & Richards (2005), and Günther & Knop (2006). Type specimens are deposited in the American Museum of Natural History, New York (AMNH), Australian Museum, Sydney (AMS) and the Bernice P. Bishop Museum, Honolulu (BPBM).

Museum abbreviations for additional comparative material (Appendix) follow Leviton *et al.* (1985). Geo-spatial coordinates are derived from topographic maps.

Systematic descriptions

Oreophryne ampelos n. sp.

Figs. 1–2

Type material. Holotype female: Papua New Guinea, Western Province, Imigabip [5.2833°S 141.4833°E], 11 December 1969, collected by F. Parker, AMS 30742. Paratypes: same data as holotype, AMS 30741, BPBM 35949 (formerly AMS 30743), AMNH 84535–37; same data as holotype except collected 10 December, AMNH 84538–40; Finalbin [5.21°S 141.21°E], 27–28 July 1987, collected by R. Zweifel, F. Parker, and L. Penny, AMNH 130500.

Diagnosis. A large species of *Oreophryne* (adult male SV = 26.3–31.5 mm, adult female SV = 31.3–35.1 mm) distinguished by its combination of a ligamentous connection of the procoracoid to the scapula, webbing between the



Fig. 2. Portrait in life of paratype AMNH 130500 from Finalbin, Western Province. Photo taken by R. Zweifel.

toes, fifth toe subequal in length to the third or slightly longer, relatively short leg ($TL/SV = 0.40\text{--}0.46$), relatively long and narrow snout ($EN/SV = 0.083\text{--}0.099$, $IN/SV = 0.074\text{--}0.092$, $EN/IN = 1.0\text{--}1.2$), relatively wide head ($HW/SV = 0.37\text{--}0.42$), relatively small finger discs ($3rdF/SV = 0.067\text{--}0.080$), and dorsal pattern of brown punctations on a pale straw-yellow ground color which gives an overall appearance of a uniformly light tan, uniformly dark tan, or mottled light and dark tan animal (Figs. 1–2).

Comparisons with other species. The new species differs from all Papuan congeners except *Oreophryne albopunctata*, *O. bairoi*, *O. furu*, *O. hypsiops*, *O. insulana*, *O. kapisa*, *O. mertonii*, and *O. unicolor* in the combination of having a ligamentous connection between the procoracoids and the scapula, in having the toes webbed, and having the third and fifth toes subequal in length. It is larger than each of these species, which never attain 30 mm SVL. In addition, *O. insulana*, *O. kapisa*, and *O. unicolor* have only basal webbing, whereas that in *O. ampelos* extends to the penultimate tubercle on the fifth toe and extends up to or slightly below that on the third toe; *O. albopunctata*, *O. hypsiops*, and *O. mertonii* have narrower heads ($HW/SL = 0.30\text{--}0.37$), whereas that of *O. ampelos* is wider ($HW/SV = 0.37\text{--}0.42$); *O. furu* has a whitish snout and postocular stripe and dark dorsolateral stripes and interocular bar, all of which are absent in *O. ampelos*, and it has a wider snout ($IN/SV = 0.089\text{--}0.096$, mean 0.093 in *O. furu* vs. $IN/SV = 0.074\text{--}0.092$, mean 0.081 in *O. ampelos*); and *O. bairoi* has the top of the snout light colored and a pale postocular stripe, both lacking in *O. ampelos*.

Oreophryne ampelos differs from all other members of the genus except *O. anthonyi* and *O. idenburghensis* in its large size. It differs from *O. idenburghensis* in being smaller ($SV = 43\text{--}47$ mm in *O. idenburghensis*), having a ligamentous

(vs. cartilaginous) connection between the procoracoid and scapula, the third and fifth toes subequal in length ($T5 > T3$ in *O. idenburghensis*), more toe webbing, a wider head ($HW/SV = 0.34\text{--}0.35$ in *O. idenburghensis*), longer snout ($EN/SV = 0.069\text{--}0.070$ in *O. idenburghensis*), and smaller finger discs ($3rdF/SV = 0.077\text{--}0.091$ in *O. idenburghensis*). *Oreophryne anthonyi* is larger ($SV = 30\text{--}47$ mm) than *O. ampelos*, has the fifth toe longer than the third, a pair of)-(shaped folds between the scapulae (lacking in *O. ampelos*), and has a shorter and broader snout ($EN/IN = 0.93\text{--}0.97$ in *O. anthonyi*).

Description (holotype AMS 30742). Adult female with incision on right side. Head wide ($HW/SV = 0.37$), with steeply oblique, slightly concave loreal region. Canthus rostralis rounded, shallowly concave when viewed from above. Nostrils directed anterolaterally, closer to tip of snout than to eyes. Internarial distance narrower than distance from naris to eye ($EN/SV = 0.83$, $IN/SV = 0.074$, $EN/IN = 1.12$). Snout slightly rounded and protruding when viewed from the side, shallowly angulate when viewed from above. Eyes moderately large ($EY/SV = 0.12$); eyelid somewhat greater than half width of interorbital distance. Tympanum indistinct and small ($TY/SV = 0.034$). Dorsal skin smooth; ventral surfaces coarsely granular; supratympanic fold obscure, barely developed. Fingers unwebbed, bearing discs with terminal grooves ($3rdF/SV = 0.067$); relative lengths $3 > 4 > 2 > 1$. Finger discs approximately twice width of penultimate phalanges. Subarticular tubercles well developed; inner metacarpal tubercle oval and well developed; outer absent. Toes webbed, webbing reaching penultimate tubercles on T2 and T5 and almost reaching penultimate tubercle on T3. Toes bearing discs with terminal grooves ($4thT/SV = 0.058$); relative lengths $4 > 5 = 3 > 2 > 1$. Toe discs smaller than those of fingers ($3rdF/4thT = 1.15$),

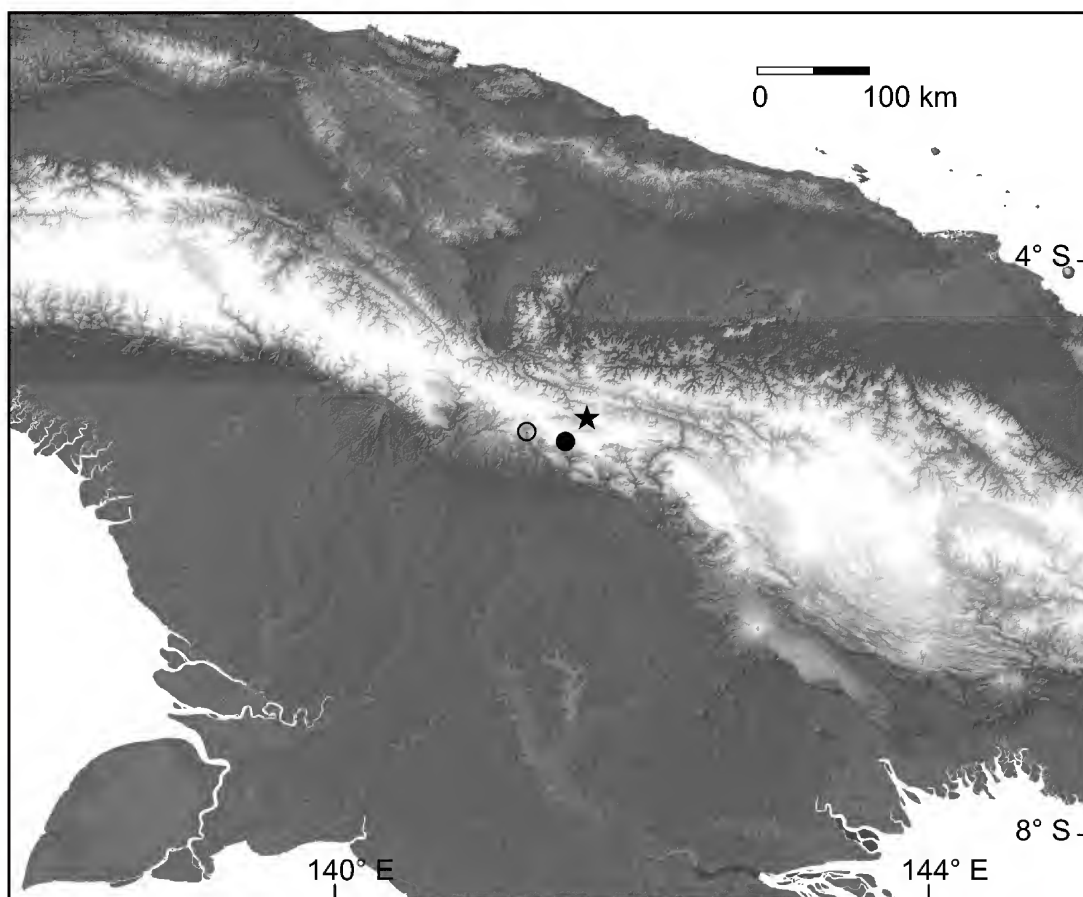


Fig. 3. Locality records for *Oreophryne ampelos* (● = type locality, ○ = other locality) and *Xenorhina brachyrhyncha* (★) in Western Province, Papua New Guinea.

approximately twice width of penultimate phalanges, except approximately 1.5 times width on T1. Subarticular tubercles distinct; inner metatarsal tubercle low and oval; outer absent. Hind legs rather short (TL/SV = 0.40).

In preservative, dorsum with pale straw-yellow ground color heavily stippled with minute brown punctations; stippling irregular in distribution, producing a mottled impression to the naked eye. Eyelids dark gray-brown; tympanum lighter than surrounding skin; face stippled more darkly than top of head or areas immediately behind. Rear of thighs as for dorsum. Venter pale straw yellow with brown punctations concentrated around lower jaw margin, and with sparse minute punctations scattered throughout chin and throat. Abdomen clear of punctations, and under legs virtually so. Iris black.

Measurements (in mm). SV = 35.1, TL = 14.0, HW = 13.1, HL = 10.6, IN = 2.6, EN = 2.9, SN = 4.5, EY = 4.1, TY = 1.2, 3rd F = 2.35, 4th T = 2.05.

Variation. Mensural variation for the few specimens of the type series is little (Table 1), and there appear to be no consistent difference between the sexes. The third and fifth toes are usually subequal in length, but a few specimens have the fifth toe slightly longer than the third. Toe webbing typically reaches up to the penultimate tubercle on the fifth toe but may either reach the bottom of the penultimate tubercle on the third toe or lie entirely below it.

Specimens vary in appearance from light tan to dark tan dorsally and are typically unicolor (Fig. 1), but may be mottled

(Fig. 2); these differences reflect the degree to which minute dark-brown punctations, which produce the darker appearance, are distributed across the dorsum. Some specimens have stippling limited to the face and top of head; others have it evenly distributed across both dorsum and venter. One specimen (BPBM 35949) is very similar in coloration to the holotype but the dorsum is less mottled; the tympanum is not lighter and face not darker than the surrounding skin; and the chin, throat, and chest are more densely stippled with brown. AMNH 130500 too is heavily stippled laterally and dorso-laterally but has the top of head and mid-dorsum with little dark stippling, producing an appearance of a medium-brown frog mottled mid-dorsally with light tan. In life, this animal had a striking pattern of yellow tan and dark brown with pale blue-white flecks scattered across the dorsum and legs (Fig. 2). Two paratypes (AMS 30741 and AMNH 84537) have a wide light-tan vertebral stripe, margined on each side by a slightly narrower dark-brown stripe. In a few animals, the dark stippling is somewhat more concentrated along the canthus, giving the appearance of a vague darker line there. In life, AMNH 130500 had a tan iris with a few black veins (Fig. 2).

Mature males vary from 26.3–31.5 mm SV; mature females from 31.3–35.1 mm; BPBM 35949 is an immature female at 30.2 mm.

Etymology. The species is named, in allusion to its arboreal habits, for one of the hamadryads, demigods of Greek mythology who lived in trees. It is a proper noun in apposition, and the accent occurs on the first syllable.

Table 1. Mensural data for type series of *Oreophryne ampelos*. BPBM 35949 is immature; all others are mature.

character	AMS 30741 male	AMS 30742 female	BPBM 35949 female	AMNH 84535 female	AMNH 84536 female	AMNH 84537 female	AMNH 84538 female	AMNH 84539 male	AMNH 84540 female	AMNH 130500 male
SV (mm)	31.5	35.1	30.2	35.0	35.1	33.3	31.3	26.3	31.6	28.9
TL	13.4	14.0	12.5	15.4	15.0	13.8	14.2	12.0	14.0	12.2
EN	3.0	2.9	2.7	3.0	3.1	3.0	2.6	2.6	3.0	2.6
IN	2.5	2.6	2.5	2.8	2.7	2.6	2.4	2.3	2.9	2.4
SN	4.7	4.5	4.0	4.4	4.6	4.3	4.4	3.9	4.6	3.7
TY	1.2	1.2	1.1	1.4	1.4	1.6	1.3	1.2	1.5	1.2
EY	3.5	4.1	3.7	4.2	3.9	4.0	3.4	3.4	3.7	3.4
HW	12.2	13.1	11.2	12.9	13.6	12.5	11.9	11.0	12.2	10.7
HL	10.4	10.6	9.6	11.0	11.2	10.8	10.1	9.6	10.6	9.4
3rdF	2.15	2.35	2.30	2.56	2.70	2.30	2.38	2.05	2.54	1.99
4thT	1.75	2.05	1.95	1.96	2.36	1.68	1.96	1.49	2.04	1.76
TL/SV	0.43	0.40	0.41	0.44	0.43	0.41	0.45	0.46	0.44	0.42
EN/SV	0.095	0.083	0.089	0.086	0.088	0.090	0.083	0.099	0.095	0.090
IN/SV	0.079	0.074	0.083	0.080	0.077	0.078	0.077	0.087	0.092	0.083
SN/SV	0.15	0.13	0.13	0.13	0.13	0.13	0.14	0.15	0.15	0.13
TY/SV	0.038	0.034	0.036	0.040	0.040	0.048	0.042	0.046	0.047	0.042
EY/SV	0.11	0.12	0.12	0.12	0.11	0.12	0.11	0.13	0.12	0.12
HW/SV	0.39	0.37	0.37	0.37	0.39	0.38	0.38	0.42	0.39	0.37
HL/SV	0.33	0.30	0.32	0.31	0.32	0.32	0.32	0.37	0.34	0.33
3rdF/SV	0.068	0.067	0.076	0.073	0.077	0.069	0.076	0.078	0.080	0.069
4thT/SV	0.056	0.058	0.065	0.056	0.067	0.050	0.063	0.057	0.065	0.061
EN/IN	1.20	1.12	1.08	1.07	1.15	1.15	1.08	1.13	1.03	1.08
3rdF/4thT	1.23	1.15	1.18	1.31	1.14	1.37	1.21	1.38	1.25	1.13
HL/HW	0.85	0.81	0.86	0.85	0.82	0.86	0.85	0.87	0.87	0.88

Distribution. Known only from the type locality in the Hindenburg Range at 1280 m elevation of western Papua New Guinea (Fig. 3) and a second locality c. 30 km to the WNW in the Star Mountains at 840 m.

Xenorhina brachyrhyncha n. sp.

Fig. 4

Type material. Holotype female: Papua New Guinea, West Sepik Province, Telefomin [5.123° S, 141.637° E], 24 November 1956, collected by D. McMichael, AMS 15021. Paratype: same data as holotype except collected 26 November, BPBM 31889 (formerly AMS 15021).

Diagnosis. A small species of *Xenorhina* (adult female SV = 21.2–22.8 mm) with a single odontoid spike, slightly expanded discs with circum-marginal grooves on all toes except T1, inflated lores, relatively long legs ($TL_{fold}/SV = 0.40–0.43$, $TL_{knee}/SV = 0.46–0.49$), relatively short and broad head ($HL/SV = 0.30–0.32$, $HW/SV = 0.35–0.38$, $HL/HW = 0.85–0.86$), relatively short and broad snout ($EN/IN = 1.06–1.13$), abdomen straw with reticulation of brown flecks (Fig. 4), no dark loreal stripe, no dark supratympanic stripe, no white vertebral line, and rear of thighs brown with scattered straw flecks but with no white line or stripe.

Comparisons with other species. The single odontoid spike and very small size of the new species distinguish it from all congeners except *Xenorhina anorbis* and *X. lanthanites*. It is distinguished from *X. anorbis* by its longer legs ($TL_{fold}/SV = 0.40–0.43$ vs. $0.29–0.32$ in *X. anorbis*), shorter snout ($EN/IN = 1.06–1.13$ vs. $1.26–1.32$ in *X. anorbis*), presence on the toes of discs bearing terminal grooves (discs and grooves absent in *X. anorbis*), and abdomen straw with reticulum of

dark flecks (uniformly light in *X. anorbis*). *X. brachyrhyncha* is distinguished from *X. lanthanites* in having an inflated (vs. concave) loreal region (Fig. 5), shorter and broader snout ($EN/IN = 1.06–1.13$ vs. $1.13–1.21$ in *X. lanthanites*), slightly longer leg ($TL_{knee}/SV = 0.46–0.49$ vs. $0.42–0.46$ in *X. lanthanites*), smaller and more obscure tympanum ($TY/SV = 0.057$ vs. $0.066–0.070$ in *X. lanthanites*), larger foot ($FootL/SV = 0.48–0.51$ vs. $0.42–0.45$ in *X. lanthanites*), absence (vs. presence) of a circum-marginal groove on first toe; absence (vs. presence) of a broad white dorsal stripe on the rear of the thigh, absence (vs. presence) of a dark loreal stripe, and absence (vs. presence) of a dark stripe curving above and behind the tympanum. Female *X. brachyrhyncha* are the same size as male *X. lanthanites*; hence, because females are the larger sex in most asterophryines, *X. brachyrhyncha* probably also differs in being of smaller body size than *X. lanthanites*.

Xenorhina brachyrhyncha is also similar to small specimens of *X. mehelyi* but is distinguished from that species by its smaller size (SV up to 37.0 mm in female *X. mehelyi*), shorter and broader snout ($EN/IN = 1.06–1.13$ vs. $1.29–1.61$ in *X. mehelyi*), in lacking a circum-marginal groove on first toe (present in *X. mehelyi*), and lacking a white vertebral line and white line on the rear of each thigh.

Description of holotype. Adult female with right-lateral incision. Vomeropalatines each with a single enlarged odontoid spike. Head wide ($HW/SV = 0.38$), merging with body with no constriction at neck. Loreal region oblique, inflated; canthus rostralis absent; nostrils dorsoventrally compressed, directed anterolaterally, much closer to tip of snout than to eyes. Internarial distance much less than distance from naris to eye ($EN/IN = 1.06$, $IN/SV = 0.075$, $EN/SV = 0.080$). Snout inflated, slightly rounded when viewed from above, rounded when viewed from side. Eyes small ($EY/SV = 0.075$); eyelid less than half width of interorbital

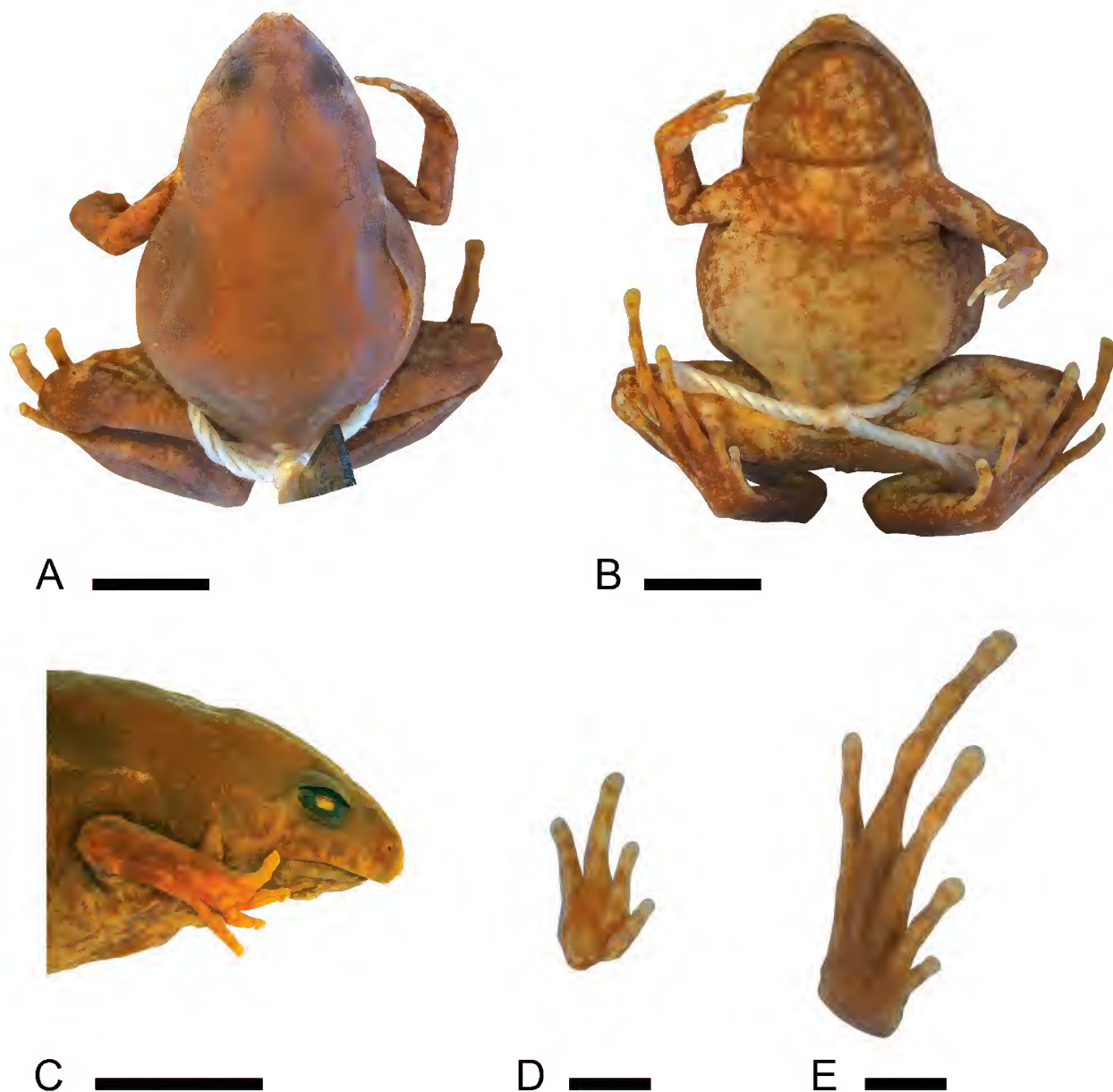


Fig. 4. *Xenorhina brachyrhyncha*, views of (A) dorsum, (B) ventrum, (C) side of head, (D) right hand, and (E) right foot of holotype (AMS 15021) of *X. brachyrhyncha*. Scale bars = 5 mm (A–C) and 2 mm (D–E).

distance. Tympanum very indistinct but large ($TY/SV = 0.057$). Dorsal, lateral, and ventral surfaces smooth; supratympanic fold slight. Fingers unwebbed, tips slightly flattened into discs on F2–F4 ($3rdF/SV = 0.025$), but only F3 with terminal groove; relative lengths $3 > 4 > 2 > 1$. Finger discs barely wider than penultimate phalanges. Subarticular tubercles absent; inner metacarpal tubercle low and oval; outer low and rounded. Toes unwebbed, bearing discs with terminal grooves ($4thT/SV = 0.039$) except on T1; relative lengths $4 > 3 > 5 > 2 > 1$. Toe discs larger than those of fingers ($3rdF/4thT = 0.64$), little wider than widths of penultimate phalanges. Neither subarticular tubercles nor metatarsal tubercles obvious. Hind legs rather short ($TL_{knee}/SV = 0.49$).

In preservative, dorsum uniformly medium brown; eyelids darker. Face and sides straw yellow heavily flecked with brown. Straw-yellow postocular stripe extending through tympanum, heavily flecked with brown and, hence, somewhat

obscure. Rear of thigh straw-yellow heavily flecked with brown, imparting the general appearance of being brown with a few pale-straw markings. Venter pale straw yellow densely covered with brown flecks from chin through chest, more sparsely flecked on abdomen. Plantar and palmar surfaces brown. Iris brown.

Measurements (in mm). $SV = 21.2$, $TL = 10.3$, $HW = 8.0$, $HL = 6.8$, $IN = 1.6$, $EN = 1.7$, $SN = 2.5$, $EY = 1.6$, $TY = 1.2$, $3rd F = 0.53$, $4th T = 0.83$.

Variation. The sole paratype is a female with enlarging but still unyolked ova. It is similar to the holotype in color pattern, but has a few obscure pale-straw markings dorsally, has less brown flecking on the abdomen, and has a somewhat more distinct pale postocular stripe. Its measurements are: $SV = 22.8$, $TL = 10.5$, $HW = 8.0$, $HL = 6.9$, $IN = 1.5$, $EN = 1.7$, $SN = 2.4$, $EY = 1.8$, $TY = 1.3$, $3rd F = 0.56$, $4th T = 0.80$.



Fig. 5. Snouts of (A) *Xenorhina lathanites* (ZMB 69557), and (B) *X. brachyrhyncha* (AMS 15021) showing difference in shape of loreal region. Scale bar = 2 mm.

Etymology. The species name is a latinized feminine combinatorial adjective derived from the Greek words “brachys”, meaning “short” and “rhynchos”, meaning “snout”, in reference to the feature which distinguishes this species from its most similar congeners.

Range. Known only from the type locality at approximately 1500 m in the Star Mountains of western Papua New Guinea (Fig. 3).

ACKNOWLEDGMENTS. I thank Ross Sadlier (AMS), Darrel Frost and Dave Kizirian (AMNH), Ronald Vonk (ZMA), Mark-Oliver Rödel (ZMB), and Rose Singadan and Paulus Kei (UPNG) for loan of specimens; Ross Sadlier (AMS) and Mark Wilkinson (BMNH) for graciously hosting research at their institutions; Pumehana Imada for collections assistance at BPBM; Richard Zweifel for providing the photo of *Oreophryne ampelos* in life; Shep Myers for producing the figures; Brad Evans for help in producing the map; and Don Cameron for confirming correct nomenclatural grammar. This research was supported by National Science Foundation grant DEB-0743890 and by grant #020954 from the Global Biodiversity Information Facility Secretariat. This is contribution 2011-004 from the Pacific Biological Survey at the Bishop Museum.

References

- Allison, A., & F. Kraus, 2000. A new species of frog of the genus *Xenorhina* (Anura: Microhylidae) from the north coast ranges of Papua New Guinea. *Herpetologica* 56: 285–294.
- Blum, J. P., & J. I. Menzies, 1988. Notes on *Xenobatrachus* and *Xenorhina* (Amphibia: Microhylidae) from New Guinea with description of nine new species. *Alytes* 7: 125–163.
- Günther, R., 2003a. Three new species of the genus *Oreophryne* from western Papua, Indonesia. *Spixiana* 26: 175–191.
- Günther, R., 2003b. Further new species of the genus *Oreophryne* (Amphibia, Anura, Microhylidae) from western New Guinea. *Zoologische Abhandlungen, Dresden* 53: 65–85.
- Günther, R., & R. Knop, 2006. A new species of *Xenobatrachus* (Anura, Microhylidae) with a striking resemblance to *Xenorhina bouwensi*. *Zootaxa* 1268: 39–57.
- Günther, R., & S.J. Richards, 2005. Two new tree-dwelling species of the genus *Xenorhina* from New Guinea (Anura, Microhylidae). *Mitteilungen aus dem Museum für Naturkunde in Berlin, Zoologische Reihe* 81: 167–176.
doi:10.1002/mmz.200510010
- Günther, R., S.J. Richards, & D. Iskandar, 2001. Two new species of the genus *Oreophryne* from Irian Jaya, Indonesia. *Spixiana* 24: 257–274.
- Günther, R., S. Richards, B. Tjaturadi, & D. Iskandar, 2009. A new species of the microhylid frog genus *Oreophryne* from the Mamberamo Basin of northern Papua Province, Indonesian New Guinea. *Vertebrate Zoology* 59: 147–155.
- Kraus, F., & A. Allison, 2002. A new species of *Xenobatrachus* (Anura: Microhylidae) from northern Papua New Guinea. *Herpetologica* 58: 56–66.
doi:10.1655/0018-0831(2002)058[0056:ANSOXA]2.0.CO;2
- Kraus, F., & A. Allison, 2003. A new species of *Xenorhina* (Anura: Microhylidae) from western New Guinea. *Proceedings of the Biological Society of Washington* 116: 803–810.
- Kraus, F. & A. Allison, 2006. Three new species of *Cophixalus* (Anura: Microhylidae) from southeastern New Guinea. *Herpetologica* 62: 202–220.
doi:10.1655/05-09.1
- Leviton, A.E., R.H. Gibbs Jr., E. Heal, & C.E. Dawson, 1985. Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia* 1985: 802–832.
- Menzies, J. I., & M.J. Tyler, 1977. The systematics and adaptations of some Papuan microhylid frogs which live underground. *Journal of Zoology, London* 183: 431–464.
doi:10.1111/j.1469-7998.1977.tb04198.x
- Parker, H.W., 1934. A Monograph of the Frogs of the Family Microhylidae. British Museum (Natural History), London, U. K.
- Richards, S.J., 2007. A new species of *Nyctimystes* (Anura, Hyliidae) from Papua New Guinea and comments on poorly-known members of the genus. *Phyllomedusa* 6: 105–118.
- Richards, S.J., A.L. Mack, & C.C. Austin, 2007. Two new species of *Platymantis* (Anura: Ceratobatrachidae) from the Admiralty Archipelago, Papua New Guinea. *Zootaxa* 1639: 41–55.
- Richards, S., & D. Iskandar, 2000. A new minute *Oreophryne* (Anura: Microhylidae) from the mountains of Irian Jaya, Indonesia. *Raffles Bulletin of Zoology* 48: 257–262.
- Roux, J., 1910. Reptilien und Amphibien der Aru- und Kei-Inseln. *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* 33: 211–247.
- Zweifel, R.G., 1972. Results of the Archbold expeditions. No. 97. A revision of the frog subfamily Asterophryinae family Microhylidae. *Bulletin of the American Museum of Natural History* 148: 411–546.
- Zweifel, R.G., 1985. Australian frogs of the family Microhylidae. *Bulletin of the American Museum of Natural History* 182: 265–388.
- Zweifel, R.G., 2003. A new species of microhylid frog, genus *Oreophryne*, from Papua New Guinea. *American Museum Novitates* 3419: 1–8.
doi:10.1206/0003-0082(2003)419%3C0001:ANSOMF%3E2.0.CO;2
- Zweifel, R.G., H.G. Cogger, & S.J. Richards, 2005. Systematics of microhylid frogs, genus *Oreophryne*, living at high elevations in New Guinea. *American Museum Novitates* 3495: 1–25.
doi:10.1206/0003-0082(2005)495[0001:SOMFGO]2.0.CO;2
- Zweifel, R.G., J.I. Menzies, & D. Price, 2003. Systematics of microhylid frogs, genus *Oreophryne*, from the North Coast Region of New Guinea. *American Museum Novitates* 3415: 1–31.
doi:10.1206/0003-0082(2003)415%3C0001:SOMFGO%3E2.0.CO;2

Appendix

Additional specimens examined

- Oreophryne albopunctata*: Indonesia: Papua Province: Lorentz River, near Sabang (ZMA 5821, syntype).
- Oreophryne anthonyi*: Papua New Guinea: Central Province: Mt. Victoria (BMNH 1947.2.12.38–39, syntypes).
- Oreophryne anamiatoi*: Papua New Guinea: Southern Highlands Province: Muller Range, E slope Mt. Itukua (BPBM 33768, holotype, 33763–67, 33769–79, PNGM 24097–100, paratypes).
- Oreophryne biroï*: Papua New Guinea: East Sepik Province: Hunstein Mts., E slope Mt. Hunstein (BPBM 23481–85); Madang Province: Adelbert Mts., Keki Lodge, 4° 42.291'S 145° 24.251'E, 854 m (BPBM 34689–92); West Sepik Province: Bewani Mts., Trefas Village (BPBM 14509–11), Torricelli Mts., S slope Mt. Sapau (BPBM 22786).
- Oreophryne brachypus*: Papua New Guinea: East New Britain Province: 2–12 km NNW Marmar (BPBM 22509–36).
- Oreophryne crucifer*: Indonesia: Papua Province: Went Mts. (ZMA 5819, syntype).
- Oreophryne ezra*: Papua New Guinea: Milne Bay Province: Sudest Island, Mt. Rio (BPBM 20468, holotype, 20467, 20469–95, PNGM 24086–92, paratypes).
- Oreophryne flava*: Indonesia: Papua Province: Kloofbivak, near Lorentz River (ZMA 5823, holotype).
- Oreophryne geislerorum*: Papua New Guinea: Morobe Province: Mindik (BPBM 5285–86); NW slope Mt. Shungol (BPBM 18510–12), Bowutu Mts., Kamiali Wildlife Management Area (BPBM 31473, 31877).
- Oreophryne hypsiops*: Papua New Guinea: East Sepik Province: Dreikiker (BPBM 1171, paratype), Wewak (BPBM 1179, paratype); Madang Province: near Sempì (AMNH 83043, 83045, paratypes), Wanuma, Adelbert Mts. (AMNH 83046–47, paratypes).
- Oreophryne idenburgensis*: Indonesia: Papua Province: Idenberg River, 18 km SW Bernhard Camp, 2150 m (AMNH 49663, holotype; AMNH 49666, paratype).
- Oreophryne inornata*: Papua New Guinea: Milne Bay Province: Goodenough Island, E slope Oya Madau (AMNH 57000, holotype, AMNH 56731, 56912, 56984, 57262, 57353, paratypes), Fergusson Island, E slope Oya Tabu (BPBM 16217–41, 16245), Fergusson Island, S slope Oya Waka (BPBM 16243, 1624956).
- Oreophryne insulana*: Papua New Guinea: Milne Bay Province: Goodenough Island, E slope Oya Madau (AMNH 57267, holotype, AMNH 56915, 57265–66, paratypes), Fergusson Island, E slope Oya Tabu (BPBM 16119, 16546–51).
- Oreophryne kampeni*: Papua New Guinea: Central Province: Moroka (BMNH 1947.2.12.14, holotype; BMNH 1947.2.12.43–44, paratypes).
- Oreophryne loriae*: Papua New Guinea: Central Province: Moroka (BMNH 1947.2.12.41–42, paralectotypes, BPBM 22537–39, UPNG 2184, 4155); Milne Bay Province: Alotau (UPNG 1683, 2611, 4934), Normanby Island (BPBM 16552–55).
- Oreophryne notata*: Papua New Guinea: Southern Highlands Province: E slope Mt. Itukua, Muller Range, 2170 m (BPBM 33672–706).
- Oreophryne parkeri*: Papua New Guinea: East Sepik Province: Hunstein Mts., E slope Mt. Hunstein (BPBM 23477–80); West Sepik Province: Torricelli Mts., S slope Mt. Sapau (BPBM 22781–85), Bewani Mts., Trefas Village (BPBM 23475–76).
- Xenorhina adisca*: Indonesia: Papua Province: Sudirman Mts., Tembagapura, 4.14009°S, 137.09782°E, 2200 m (MZB 8403, holotype, MZB 8404, BPBM 14915, paratypes).
- Xenorhina anorbis*: Papua New Guinea: Western Province: Finimterr, 2133 m, Star Mts. (UPNG 7261).
- Xenorhina arboricola*: Papua New Guinea: East Sepik Province: Hunstein Mts., 1.3 km S, 2.3 km E summit of Mt. Hunstein, 1000 m (BPBM 13745); West Sepik Province: Bewani Mts., S slopes of Mt. Menawa, 8.5 km N, 14 km E Utai aerodrome, 1200 m (BPBM 13746–47).
- Xenorhina arfakiana*: Indonesia: West Papua Province: Arfak Mts, between Makwam and Minyambou (UPNG 8203, holotype).
- Xenorhina bidens*: Papua New Guinea: Gulf Province: upper Turama River (UPNG 7464).
- Xenorhina bouwensi*: Indonesia: Papua Province: Star Mts., Sibil Valley, 1250 m (BPBM 1015), 3.2 km N Dasiga (BPBM 3686).
- Xenorhina eiponis*: Indonesia: Papua Province: Munggon, 1800 m (UPNG 7406, paratype).
- Xenorhina fuscigula*: Papua New Guinea: Madang Province: upper Kaironk Valley (UPNG 3242–43, paratypes); Western Highlands Province: Kaironk Valley near junction with Jimmi River, 1380 m (AMNH 83843–44), Tomba (MCZ 64805, 81672).
- Xenorhina huon*: Papua New Guinea: Morobe Province: mountains at head of Kua River Valley, 1630–2185 m (AMNH 76054, 76057–59, 76061, 76065, 76082, 76086, 76089), Indagen, N slope of Mt Kirin (AMNH 76099), Rawlinson Mts, upper Kua River Valley (UPNG 7426, 7428, paratypes).
- Xenorhina lanthanites*: Indonesia: Papua Province: Yapen Island, 17 km NE Serui, Amoman Mt., 1100 m (ZMB 69557, 69559–60, paratypes).
- Xenorhina macrops*: Indonesia: Papua Province: 3 km N Tempagapura (AA field series 15366–67, at BPBM), Tempagapura (AA field series 15494, at BPBM).
- Xenorhina meheli*: Papua New Guinea: Chimbu Province: Bomai, Tive Plateau (MCZ 53099); Gulf Province: Darai Plateau, 15.7 km N and 2 km E of Koumaio Landing Ground (BPBM 28177–82); National Capitol District: Omati, near Port Moresby (MCZ 28203–04); Southern Highlands Province: Namosado (AMS 122140, 122149, BPBM 35948); Western Province: Derongo (AMNH 82291, MCZ 81673), Imigabip (AMNH 84544, MCZ 80502, 81675), lower Kam Valley, Ok Tedi, 760 m (UPNG 7263).
- Xenorhina minima*: Indonesia: Papua Province: Serabum, 2400 m (UPNG 7409).
- Xenorhina multisica*: Indonesia: Papua Province: Jayawijaya Division: Munggon, Eipomek Valley (UPNG 7404, paratype).
- Xenorhina ocellata*: Indonesia: Papua Province: 9 km NE Lake Habbema (AMNH 43724), Bele River, 18 km N Lake Habbema (AMNH 43728, FMNH 121909); Fakfak District: Tembagapura, 2200 m (BPBM 14057–64), Hellwig Mts, 2500 m (FMNH 100100, syntype).
- Xenorhina ophiodon*: Indonesia: West Papua Province: Arfak Mts, between Makwam and Minyambou (UPNG 8210).
- Xenorhina oxycephala*: Papua New Guinea: East Sepik Province: 8.7 km N, 9.8 km E Mt. Hunstein, 75 m (BPBM 14269); West Sepik Province: 2 km W Utai aerodrome, 260 m (BPBM 13756–57).
- Xenorhina parkerorum*: Papua New Guinea: Chimbu Province: Nogar Village, Keowagi, 2200 m (UPNG 9358–59).
- Xenorhina rostrata*: Papua New Guinea: Madang Province: lower Kaironk Valley, 1300 m (UPNG 1926, neotype, 1063, 1920, 1922, 1924–25, 1929), Mt Gulno, 1044 m (UPNG 9264).
- Xenorhina schiefenhoeveli*: Indonesia: Papua Province: Munggon, Eipomek Valley, 1800 m (UPNG 7399, holotype, AMNH 128238, paratype).
- Xenorhina subcrocea*: Papua New Guinea: Morobe Province: 11 km N Lae (UPNG 4393, holotype, 4390, paratype).
- Xenorhina tumulus*: Papua New Guinea: Madang Province: Adelbert Mts, Mambim, 1500 m (UPNG 7238, holotype); West Sepik Province: 2 km W of Utai Aerodrome, 210 m (BPBM 14065–66), Torricelli Mts., 3.2 km SSE Mt. Sapau summit (BPBM 22795).
- Xenorhina zweifeli*: Papua New Guinea: West Sepik Province: Bewani Mts., Mt. Menawa (BPBM 14052, holotype, BPBM 14047–51, 14054–56, paratypes).